Model 132A

MODEL 132A
PULSE GENERATOR

SERIAL NOS. PREFIXED A

132A

E-H RESEARCH LABORATORIES, INC.
163 ADELINE STREET · OAKLAND 20, CALIFORNIA

BASE
RED
4 GREY
3 BLUE
2 GRN
1 RED
PWR LINE

MODEL 132A

PULSE GENERATOR

SERIAL NOS. PREFIXED A

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EH RESEARCH LABORATORIES, INC.

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WARRANTY

This instrument is guaranteed to be free of defects in materials and workmanship for a period of one year following delivery. Excluded items under this warranty are tubes, fuses, transistors, and diodes. In the event of failure, written notice of the nature of the trouble and the instrument serial number should be sent to the factory. E-H Research Laboratories, Inc., will then send instructions for component replacement or return shipment to the factory or local representative.

SPECIFICATIONS

The E-H Model 132A Pulse Generator is designed to provide fast rise time, high current pulses over a broad range of pulse widths and repetition rates. It is suitable for a variety of applications including design problems involving magnetic materials, solid state research, high speed diode and transistor switching characteristics, and high current logic and memory circuits. It includes provisions for external driving or gating, provides a trigger for sync purposes, and an output attenuator.

REPETITION RATE - 5 cps to 3.5 megacycles internally selectable by a front panel step and vernier control. The instrument may be externally driven from zero to 3.5 megacycles by a positive 4-volt pulse.

RISE TIME - Positive Pulse: Typically 10 nanoseconds and less than 12 nanoseconds, variable to more than 100 nanoseconds. Negative Pulse: Typically 9 nanoseconds and less than 10 nanoseconds, variable to more than 100 nanoseconds.

FALL TIME - Typically 15 nanoseconds, 10 per cent to 90 per cent.

PULSE OUTPUT - 50 volts.

OUTPUT IMPEDANCE - 50 ohms.

PULSE WIDTH - Less than 100 nanoseconds to more than 10 milliseconds continuously variable by step and vernier controls.

PULSE DELAY - Less than 100 nanoseconds to more than 10 milliseconds continuously variable by step and vernier controls.

POLARITY - Positive or negative pulses selected on the front panel.

DUTY FACTOR - 25 per cent at full amplitude; 50 per cent at reduced amplitude. An automatic limiter prevents overload.

OUTPUT ATTENUATOR - Up to 150:1, coarse selector and continuous vernier control.

JITTER - Less than 0.1 per cent.

TRIGGER OUTPUT - For sync purposes, a 5-volt negative pulse approximately 50 nanoseconds wide is provided.

EXTERNAL DRIVE - A 4-volt positive pulse is required to externally drive the Model 132A.

ELECTRONIC GATE - 5 volts negative connected to the gate input will interrupt the pulse train for the duration of its presence. Input impedance is 2.4 K.

DIMENSIONS

Rack Mounted: 7" high, 19" wide, 16" deep.
Weight: 22 lbs. net; 30 lbs. packed; 42 lbs. packed for export.

ACCESSORIES

End frames are available for bench use. Price $35.

For short pulses, use the Model ZT Series Pulse Transformers to invert the output pulse or to match other impedances. Standard impedances are any permutation of 50, 93, 125, 185, or 200 ohms, normal or inverting. Coaxial body with BNC connectors. Price $35.

Use the Model RT Rise Time Integrators to obtain precise rise times in applications where responses to slow rise times are important. Standard rise times of 5, 10, 20, 50, and 100 nanoseconds; other values on special order. Price $35.

Use Model 921 Variable Delay Generator between an external driving source and a Model 132A to obtain precise pulse positioning; or between two or more Model 132A's. Continuously variable delays from 50 nanoseconds to 100 microseconds. Price $425.

The coarse DELAY selector and the FINE vernier provide continuous control over the relative position of the trigger output and pulse output. The pulse output can be delayed from .1 microsecond to 10 milliseconds with respect to trigger output.

The amplitude of the output pulse is continuously variable over an approximate 3:1 range by the AMPLITUDE control.

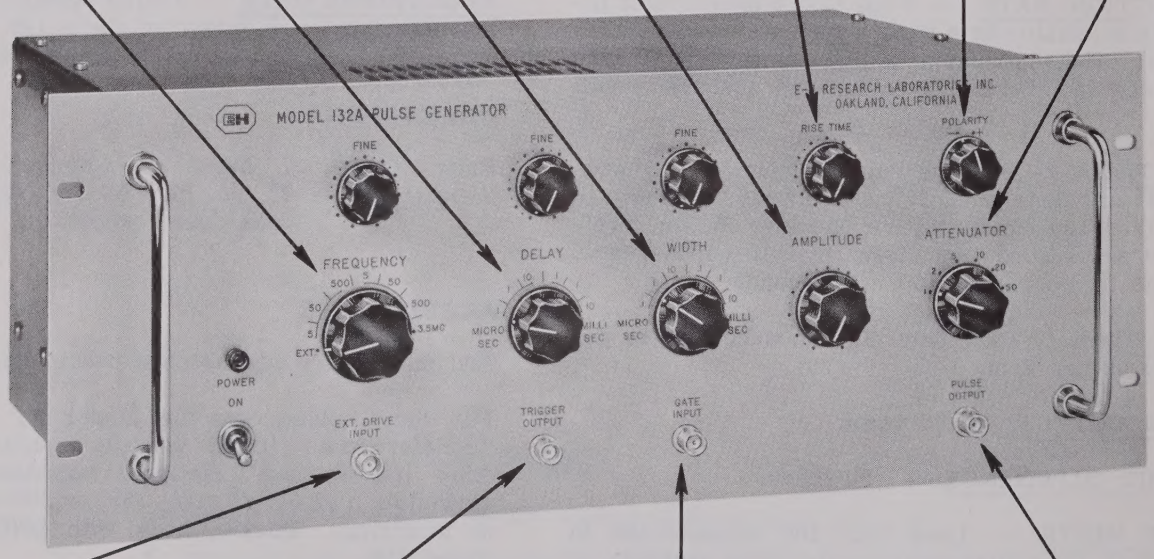
The POLARITY switch selects either positive or negative output pulses.

The internal rep. rate is controlled by a coarse FREQ. RANGE selector, which is calibrated in decade steps. The FINE control provides continuous coverage within the selected decade range.

The coarse WIDTH selector switch and FINE control vary the width of output pulses from .1 microsecond to 10 milliseconds.

The RISE TIME control varies the leading edge rise time from 10 to 100 nanoseconds.

The six step ATTENUATOR provides attenuation from 1:1 to 50:1.



To drive the instrument externally, FREQ. RANGE selector must be set to EXT. and 4-volt negative pulse applied to the EXT. DRIVE INPUT connector.

The trigger output is a negative 5-volt pulse.

A negative 5-volt signal applied to the GATE INPUT will interrupt the pulse train as long as the signal remains.

The pulse train is taken from the PULSE OUTPUT connector. The output is designed to operate into a 50-ohm, resistive load.

OPERATING INFORMATION

230-VOLT OPERATION

The internal power supply of the Model 132A is normally wired for 115-volt operation. Simple rewiring of the transformer primary permits operation at 230 volts. Refer to the schematic diagram at the back of this manual for the proper primary connection to provide operation at 230 volts.

CONTROLS

The operating controls, which are mounted on the front panel, and the instructions for their proper use are shown in the illustration on the opposite page.

OUTPUT IMPEDANCE

The Model 132A is a current source when the output pulse is negative and a voltage source when the output pulse is positive. Although the impedance at the output connector is not 50 ohms, the instrument is designed to operate into a 50-ohm resistive load. Operation into any other impedance will cause some pulse distortion. Loads with appreciable capacitive or inductive components will have a marked effect on the leading and falling edges of the pulse.

Use the Model ZT Pulse Transformer to match the Model 132A output to other impedances.

CAUTION

The instrument should always be operated with a load connected to the output.

DUTY CYCLE

The duty cycle limitation is to insure long life by conservative operation of the output tubes. The duty cycle is controlled electronically by monitoring the output current to maintain it at a maximum of 250 milliamps average. The effect is that as the duty cycle reaches 25 per cent, the amplitude of the output pulse is proportionately decreased as the duty cycle is increased.

NOTE

The minimum available pulse width and the duty cycle limitation prevent full output at 3.5 megacycles.

Typically, pulse widths of up to 80 per cent of the period can be obtained. Extending the pulse width past the normal period may cause the generator to scale down in frequency or unusual pulse distortion conditions to appear. However, no damage can occur to the instrument.

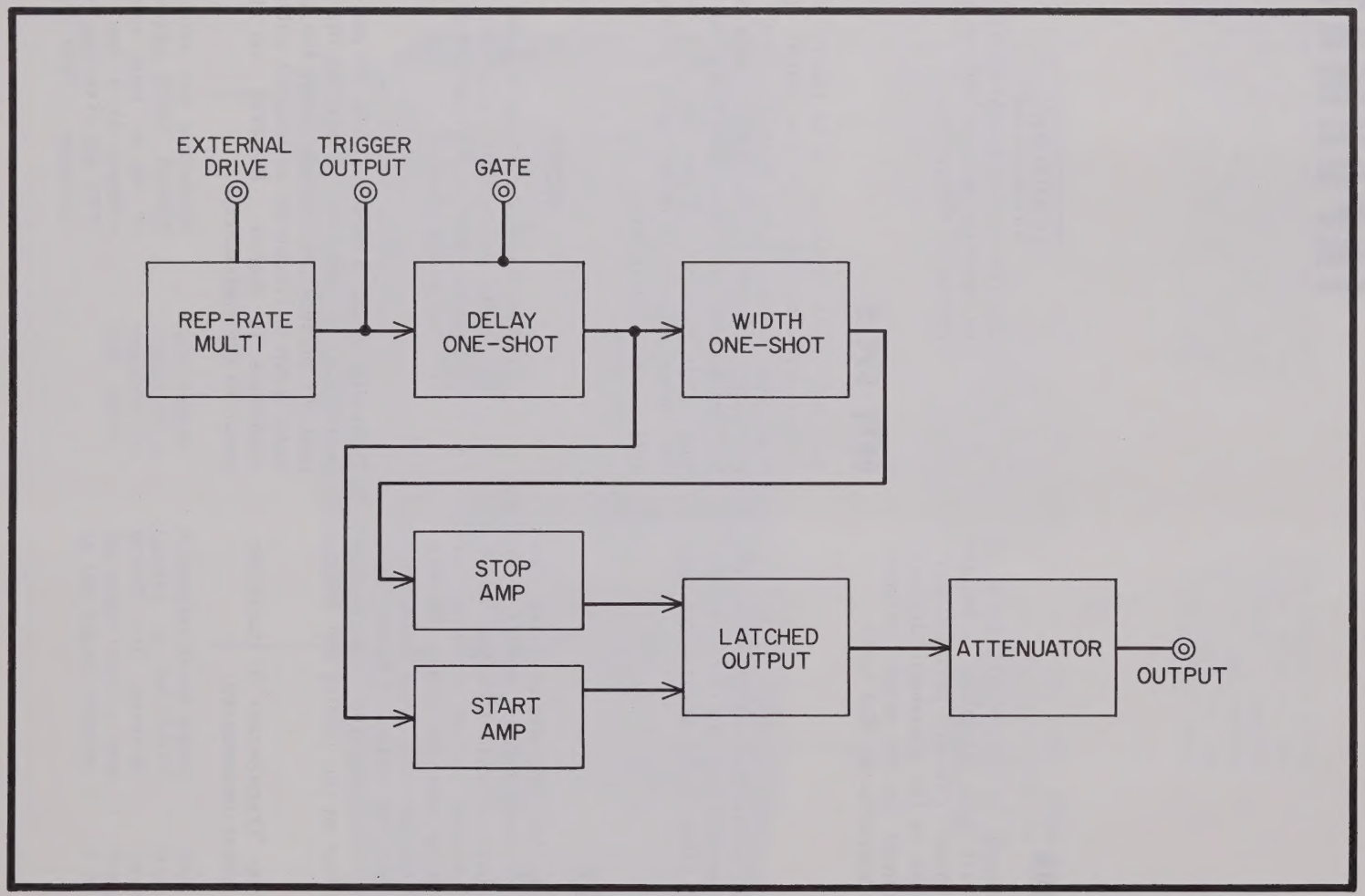


FIG. 1 BLOCK DIAGRAM, MODEL 132A

THEORY OF OPERATION

GENERAL DESCRIPTION

Refer to the block diagram on the opposite page. The basic timing cycle is initiated by a symmetric multivibrator, which may be free-running or externally driven. The output from the repetition rate multivibrator is differentiated, amplified, and applied to a gate circuit which passes a signal to the delay one-shot multivibrator unless a voltage is applied to the gate input, which then blocks the pulse train. The output of the amplifier is also coupled to the trigger output amplifier.

The delay one-shot multivibrator determines the position of the output pulse with respect to the trigger. The signal from the delay one-shot is amplified and goes to the width one-shot multivibrator, which determines the width of the output pulse. The signal from the delay amplifier is also applied to the start amplifier to initiate the start of the output pulse.

The output from the width one-shot amplifier is applied to the stop amplifier to initiate the stop of the output pulse. The start and stop amplifiers drive the latch. The latch is a quasi-stable circuit which is turned on by the start signal and remains in that state, providing a constant amplitude output level, until turned off by the stop signal.

REPETITION RATE MULTIVIBRATOR

Q1 and Q2 comprise a free-running multivibrator capable of running at very fast repetition rates. To understand the operation of this multivibrator, assume that the switching is as shown on the schematic and that the timing capacitor has charged up to some positive level. Q1 is consequently turned off and Q2 is forced into conduction by the negative bias obtained through R3, CR3, and R9. The timing capacitor on the base of Q1 will discharge through variable resistor R2 and fixed resistor R8 to the negative voltage level at the base of Q2.

It is important to note that because Q2 is conducting, there is a voltage drop across R7 and, consequently, the emitter voltage of Q2 is less than the emitter voltage of Q1. Thus, the timing capacitor on the base of Q1 will discharge to the voltage level at the base of Q2 until such time as the base emitter drop of Q1 becomes less than the base emitter drop of Q2. Q1 will then start to conduct; its collector voltage will start to go positive, which in turn will cause the base of Q2 to go positive, forcing it out of conduction.

The timing capacitor now takes on the charge due to the difference in potentials between the bases. As the capacitor charges, Q1 remains in conduction until the difference in potential between the bases is slightly less than the bias developed across R4. When this occurs, Q2 is forced back into conduction and Q1 becomes cut-off.

AMPLIFIER AND GATE

Q3 is an amplifier to drive the delay multivibrator. In a condition without the presence of a gate signal, Q3 is nonconducting. The differentiated pulse from the multivibrator is amplified by Q3 when a gating signal is not present.

The gate amplifier Q4 is connected with its emitter in parallel with Q3. Q4 also is cut-off as determined by the biases of the diodes. When a negative 5-volt gating signal is applied to the base of Q4, the common emitters of Q3 and Q4 are held several volts negative. Q3, then, cannot conduct and the pulse chain is interrupted for as long as the gating signal is applied. Note that the zener diode protects the base of Q4 from being driven too far negative by large amplitude gating signals.

TRIGGER OUTPUT

The amplifier output is capacitively coupled to Q5. The trigger output amplifier Q5 produces a sharp negative trigger spike, approximately 5 volts in amplitude, which is delivered to the front panel through a capacitor.

DELAY MULTIVIBRATOR

The output of amplifier Q3 is applied directly to the delay multivibrator, comprised of Q6, Q7, and Q8. Q8 is a low impedance source for driving the timing capacitors, while Q6 and Q7 form a monostable multivibrator. In the stable condition, Q7 is biased on -- the bias being developed across the forward resistance of diode CR12. With Q7 on, Q6 is forced into nonconduction. The input of the multivibrator is the base of Q8. It is an emitter follower, and whenever a positive input pulse is received from the previous stage, it is coupled through Q8 and one of the timing capacitors to the base of Q7. Q7, which is normally conducting, is cut-off by the positive swing and Q6 is forced into conduction. As Q6 goes into conduction, its collector goes positive. The collector of Q6 is tied to the base of Q8 so the action becomes regenerative, and the multivibrator very rapidly switches to its quasi-stable state until

the timing capacitor is discharged through variable resistor, R26, and fixed resistors, R25 and R27. Variable resistor, R26, controls the discharge time and serves as the FINE DELAY control. The output of the delay multivibrator is a small positive pulse taken from the collector of Q7 by differentiating through C38. This pulse drives Q13, the start pulse amplifier.

WIDTH MULTIVIBRATOR

The operation of the width amplifier, Q9, and the width multivibrator, Q10, Q11 and Q12, is identical to the delay multivibrator, except that the drive pulse to start the width multivibrator is taken from the start amplifier Q13 through capacitor C40 to the base of Q9.

START AND STOP AMPLIFIER

The start pulse amplifier, Q13, is biased nonconducting by CR18. When the positive start pulse from the delay multivibrator arrives, it drives Q13 into conduction which provides a sharp current pulse through transformer, T2. The operation of Q16 is identical except that it receives its pulse from the width multivibrator, therefore, initiating the stop pulse.

OUTPUT CIRCUITRY

The output pentode tube V1 is operated with approximately equal loads in the plate and cathode at all times. When the POLARITY switch is in the plus position, the attenuator presents its load to the cathode and R63-66 (a 40-ohm, 8-watt resistor) is in the plate circuit. When the POLARITY switch is in the negative position, the +175 volts is grounded and V_O becomes -175 volts; the 40-ohm resistance is switched to the cathode and the output is taken from the plate of V1.

The output circuitry will be described assuming the POLARITY switch is in the positive position. The output tube V1 and transistors Q14 and Q15 form a bi-stable latching-circuit, which when driven on will remain on until driven off. CR28 is a zener diode which holds the grid at -39 volts bias during the normally off condition so that no current flows in the output tube. The collector of transistor Q14 is also held at -39 volts. When the negative start pulse from T2 is received at the base of Q14, it turns that transistor fully on. As that transistor conducts, its collector rises. The grid of V1 also rises, since it is tied to the collector of Q14, to zero bias when the transistor is fully on.

When the grid of V1 reaches zero bias, the tube is in full conduction and providing 1 amp peak, or 50 volts into the output attenuator.

Hold current to keep the transistor in saturation once it is turned on is provided by R56. This resistor is returned through the polarity switch to either ground or zero depending on the polarity position, so that when the cathode rises this point is connected to the bottom of the cathode and establishes current into the base of Q14 to hold it in conduction after the cathode has risen approximately 12 volts.

Since the current through the zener diode also flows to the cathode and, therefore, through the load, resistors R57, R58 and R59 are inserted to bleed some positive current into the cathode load to offset this negative current so that there is no DC level shift.

The stop pulse from Q16 is coupled through transformer T1 to the base of Q15. The collector of Q15 is coupled through diode CR26 to the grid of V1 so that when the stop pulse appears, the grid of V1 is again driven negative to its -39 volt turn-off bias. The third winding on T1 also provides a positive pulse through CR22 and CR23 to the base of Q14, which helps turn off this transistor at the time of the stop pulse.

DUTY CYCLE LIMITING

The output pulse amplitude is controlled by the screen voltage of V1. At maximum amplitude, the screen is approximately 260 volts. Under this condition the cathode voltage is at maximum amplitude, about 50 volts, and the average current flowing is a function of the duty cycle. This current is monitored by R125 and averaged across capacitor C106 so that it appears as a voltage on the base of Q101. The collector of Q101 is connected directly to the grid of V104, which controls the grid voltage to V106. When this bias voltage reaches a point equivalent to 250 milliamps average current, Q101 conducts and pulls the screen of V106 down, thus reducing the screen supply and output amplitude proportionately.

POWER SUPPLY

The +175 volt supply is a conventional series regulated supply and is referenced to the gas tube V105. V101 and V102 are the series regulators being controlled by V103. This +175 volts is set by adjusting the grid voltage of V103 with R112.

The +175 volt supply is floating so that both polarity output pulses may be obtained. For positive pulses, V_O is grounded; for negative output pulses, the +175 volts is placed at ground.

The -150 volt supply is shunt regulated by V105, an OA2. The +50 to +270 volt supply, which is the screen supply and output amplitude control, is regulated by the series tube V106 and the reference tube V104. This voltage is adjusted by R128 which is the front panel AMPLITUDE control. The screen supply also is floating so that both polarity output pulses may be obtained.

The low voltage timing circuit supply is controlled by two series transistors Q104 and Q105. Amplifiers Q102 and Q103 are referenced to the zener diode CR111.

PARTS LIST

IMPORTANT

ORDERING INFORMATION

Please include the following information when ordering a replacement part.

1. Model and serial number of the instrument for which the replacement part is intended.
2. Circuit reference of the replacement part.
3. E-H stock number.

Replacement parts may be ordered through your E-H representative or from the factory.

CUSTOMER SERVICE DEPARTMENT
E-H RESEARCH LABORATORIES, INC.
1 6 3 ADELINE STREET,
OAKLAND 20, CALIFORNIA
Phone: TE 4-3030
Area Code 415

CIRCUIT REFERENCE	DESCRIPTION	E-H PART NO.
DIODES		
CR1	Type 1N746, Continental Device Corp.	376-025
CR2	Not used.	
CR3	Type 1N751A, Continental Device Corp.	376-027
CR4	Type 1N34A, Sylvania	376-023
CR5	Type 1N270, Sylvania	376-031
CR6	Same as CR5.	
CR7	Same as CR1.	
CR8-11	Same as CR5.	
CR12	Type ID6-050, Texas Instruments	376-039
CR13	Same as CR4.	
CR14	Same as CR5.	
CR15	Same as CR12.	
CR16	Type 1N914B, Texas Instruments	376-022
CR17	Same as CR5.	
CR18	Same as CR16.	
CR19	Same as CR5.	
CR20-25	Same as CR12.	
CR26-27	Same as CR16.	
CR28	Type 1.5M39Z10, Motorola	374-001
CR101	Type 1N2071, Texas Instruments	376-034
CR102-110	Same as CR101.	
CR111	Type 1N753, Continental Device Corp.	376-026
VACUUM TUBES		
V1	Type 7534, Amperex	670-026
V101	Type 6080, Sylvania	670-017
V102	Same as V101.	
V103	Type 6AU6, Sylvania	670-010
V104	Same as V103.	
V105	Type OA2, Sylvania	670-007
V106	Type 7119, Amperex	670-021

NOTE: Replacement diodes and tubes must be from the manufacturer indicated to insure proper operation.

CIRCUIT REFERENCE	DESCRIPTION	E-H PART NO.
CAPACITORS		
C1	50 uf, -20+80%, 6wvdc, fixed, electrolytic	316-042
C2	5 uf, -20+80%, 6wvdc, fixed, electrolytic	316-011
C3	.5 uf, ±5%, 200wvdc, fixed, mylar	320-009
C4	.05 uf, ±5%, 200wvdc, fixed, mylar	320-005
C5	.005 uf, ±20%, 500wvdc, fixed, polystyrene	326-004
C6	500 pf, ±10%, 500wvdc, fixed, polystyrene	326-003
C7	.01 uf, -20+80%, 600wvdc, fixed, ceramic	311-012
C8	25 uf, -20+80%, 25wvdc, fixed, electrolytic	316-028
C9	Same as C7.	
C10	Same as C8.	
C11	Same as C7.	
C12	10 pf, ±10%, 1 KV, fixed, ceramic	311-001
C13	100 pf, ±10%, 1 KV, fixed, ceramic	311-007
C14	Same as C7.	
C15	150 pf, ±10% 1 KV, fixed, ceramic	311-008
C16	.001 uf, ±5%, 500wvdc, fixed, polystyrene	326-005
C17	.01 uf, ±5%, 500wvdc, fixed, polystyrene	326-006
C18	.1 uf, ±5%, 200wvdc, fixed, mylar	320-007
C19	1 uf, ±5%, 200wvdc, fixed, mylar	320-011
C20	10 uf, -20+80%, 100wvdc, fixed, electrolytic	316-032
C21	Same as C8.	
C22	Same as C7.	
C23	Same as C8.	
C24	Same as C7.	
C25	Same as C8.	
C26	Same as C7.	
C27	Same as C8.	
C28	Same as C7.	
C29	Same as C16.	
C30	Same as C17.	
C31	Same as C18.	
C32	Same as C19.	
C33	Same as C20.	
C34	Same as C7.	
C35	Same as C8.	
C36	50 pf, ±10%, 1 KV, fixed, ceramic	311-006
C37	Same as C15.	
C38	Same as C36.	
C39	Same as C6.	
C40	Same as C36.	
C41	Same as C7.	
C42	Same as C8.	
C43	.1 uf, ±20%, 75 wvdc, fixed, ceramic	311-014
C44	.1 uf, -20+80%, 500 wvdc, fixed, ceramic	311-023
C45	Same as C7.	
C46	Same as C19.	
C47-48	Same as C7.	
C101	250 uf, -20+80%, 300wvdc, fixed, electrolytic	316-040
C102	100 uf, -20+80%, 450wvdc, fixed, electrolytic	316-008
C103	Same as C102.	
C104	Same as C19.	
C105	Same as C43.	
C106	250 uf, -20+80%, 12wvdc, fixed, electrolytic	316-031
C107	Same as C6,	
C108	Same as C102.	
C109	4000 uf, -20+80%, 15wvdc, fixed, electrolytic	316-003
C110	Same as C109.	
C111-114	Same as C106.	
TRANSISTORS		
Q1	Type 2N966, Motorola	663-032
Q2	Same as Q1.	
Q3	Type 2N741, Motorola	663-025
Q4	Same as Q1.	
Q5	Type 2N706B, Texas Instruments	663-023
Q6-8	Same as Q1.	
Q9	Same as Q3.	
Q10-12	Same as Q1.	
Q13	Same as Q5.	
Q14	Type 2N1143, selected, Motorola	663-010
Q15	Type 2N832, Motorola	663-028
Q16	Same as Q5.	
Q101	Type 2N1309, Texas Instruments	663-021
Q102	Type 2N1306, Texas Instruments	663-018
Q103	Type 2N1307, Texas Instruments	663-119
Q104	Type 2N250, Texas Instruments	663-026
Q105	Same as Q104.	

NOTE: Replacement transistors must be from the manufacturer indicated to insure proper operation.

CIRCUIT REFERENCE	DESCRIPTION	E-H PART NO.
INDUCTORS		
L1	R. F. Choke	A10414
L2-8	Same as L1.	
L9	R. F. Choke	A10559-01
L10	1.5 uh, ±10%, 1/3 w, fixed	335-015
RESISTORS		
NOTE:	All resistors shown on the schematic which are not listed below are 1/2 watt, ±5%, fixed, carbon composition.	
R2	2.5 K, 2 w, AB Type, variable, composition	550-009
R26	10 K, 2 w, AB Type, variable, composition	545-006
R39	Same as R26.	
R51	22 K, ±5%, 1 w, fixed, composition	597-223
R52	12 K, ±5%, 2 w, fixed, composition	598-123
R53	Same as R52.	
R57	18 K, ±5%, 2 w, fixed, composition	598-183
R58-59	Same as R57.	
R60	500 ohms, 2 w, AB Type, variable, composition	550-029
R63	160 ohms, ±5%, 2 w, fixed, composition	596-161
R64-66	Same as R63.	
R67	100 ohms, ±5%, 2 w, fixed, composition	598-101
R68-70	Same as R67.	
R71	240 ohms, ±5%, 2 w, fixed, composition	598-241
R72-76	Same as R71.	
R77	13 ohms, ±5%, 1 w, fixed, composition	597-130
R78-79	Same as R77.	
R80	12 ohms, ±5%, 1 w, fixed, composition	597-120
R81	3.3 ohms, ±5%, 1 w, fixed, composition	597-033
R82	5.1 ohms, ±5%, 1 w, fixed, composition	597-051
R101	30 ohms, ±5%, 1 w, fixed, composition	597-300
R102	5 ohms, ±20%, 10 w, fixed, wirewound	610-017
R103	Same as R101.	
R104	4 K, ±20%, 10 w, fixed, wirewound	610-020
R110	30 K, ±5%, 1 w, fixed, composition	597-303
R112	50 K, 2 w, AB Type, variable, composition	545-008
R123	20 K, ±5%, 2 w, fixed, composition	598-203
R125	5 ohms, ±20%, 3 w, fixed, wirewound	610-003
R128	100K, 2 w, AB Type, variable, composition	550-006
R130	2.7 ohms, ±5%, 1 w, fixed, composition	597-272
R131	Same as R130.	
R134	200 ohms, 1/2 w, trim pot, variable, composition	551-001
R142	511 ohms, ±1%, 1/2 w, fixed, deposited carbon	601-062
R143	475 ohms, ±1%, 1/2 w, fixed, deposited carbon	601-061
R146	39 K, ±5%, 2 w, fixed, composition	598-393
SWITCHES		
S1	1-pole, 7-position, non-shorting	624-003
S2	2-pole, 5-position, non-shorting	624-005
S3	Same as S2.	
S4	5-pole, 2-position, non-shorting	624-008
S5	2-pole, 6-position, non-shorting	624-004
S101	Toggle, DPST	630-002
TRANSFORMERS		
T1	Pulse Transformer	A10660-01
T2	Pulse Transformer	A10661-01
T101	Power Transformer	653-016
MISCELLANEOUS		
F101	Fuse, 3A, Slo Blo 3AG	398-003
F102	Fuse, 1.5A, Slo Blo 3AG	398-013
	Fuse Holder	396-001
DS1	Pilot Lamp, Neon	510-004
	Power Cord, Belden 17460-S	786-001
	Fan Blade	388-004
	Fan Motor	543-001

REVISIONS						
ISSUE	REVISION	DATE	DRAWN	CHK'D	APP'D	E. O.
A	ORIGINAL	8/15	AAS			

PROPRIETARY INFORMATION
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D-10679 A

TITLE: MODEL 132 POWER SUPPLY — D-10679 A — SHEET NO. OF

115 VAC
F101 3A
S101 ON
DS1
R144 100K
BLK
BLK/YEL
BLK/GRN
FAN
T101
BLUE
RED
RED/YEL
BLK/RED
IN2071 30, 1W
CR101-102
R101
C103 100 450V
IN2071 5, 10W
CR103
R102
C101 250 300V
IN2071
CR104
C102 100 450V
IN2071 30, 1W
CR105-106
R103
4K, 10W
R104
V101 6080
V102 6080
R106 160K
R107 360K
R108 100
R109 22
R114 22
R115 100
R116 100
R117 22
R118 22
R119 100
V103 6AU6
R110 30K 1W
C104 .0 200V
R113 160K
R105 62K
R112 50K "175V ADJUST"
V105 0A2
150K R111
R120 100K
R121 51K
R123 20K 2W
R124 10K
Q101 2N1309
180 R122
C105 .1
C106 250 12V
5, 3W R125
100K R126
V104 6AU6
V106 7119
C107 500pf
R127 160K
C108 100 450V
R128 100K AMPLITUDE
R146 39K 2W
150K R129
RED — SCREEN SUPPLY
BLU/WHT — Vo
V10/WHT — -150V
GRAY — +175V
FILAMENTS
BRN 6.3V
BRN
6080 6080 6AU6 6AU6 7119
V101 V102 V103 V104 V106
L9
V1 7534 RF. DECK

230 VAC
F102 1.5A
S101
R145 100K
DS1
BLK
T101
BLK/YEL
BLK/GRN
BLK/RED
FAN

PRIMARY CONNECTION OF TRANSFORMER FOR 230 V AC

GRN
GRN/YEL
IN2071 2.7, 1W
CR107
CR108
R130
C109 4000 15V
C110 4000 15V
CR109
CR110
R131
IN2071 2.7, 1W
R133 150
R132 150 "+5.1V" ADJUST
R134 200
R135 510
C111 250 12V
IN753
CR111
750 R139
R140 510
R141 15
Q105 2N250
Q102 2N1306
R142 511 1%
R143 475 1%
C112 250 12V
Q103 2N1307
R136 510
R137 510
R138 510
Q104 2N250
C113 250 12V
C114 250 12V
GREEN — +5.1V
VIOLET
WHITE — -5.1V

NOTES:
UNLESS OTHERWISE SPECIFIED:
1. ALL RESISTANCES GIVEN IN OHMS
2. ALL RESISTORS ARE ½W, 5%
3. ALL CAPACITANCES GIVEN IN MICRO-FARAD

QTY -01	ITEM NO.	PART NO.	DESCRIPTION	SCHEMATIC OR SPEC. REF

MATERIAL LIST

UNLESS OTHERWISE SPECIFIED
SCALE
DIMENSIONS ARE IN INCHES
TOLERANCE FRACT.: ±
DECIMALS: ±
ANGLES: ±
HOLE DIAMETERS: ±
MACHINED SURFACES √
BREAK ↓ DEBURR SHARP EDGES
DO NOT SCALE DRAWING
FINISH:

USED ON | NEXT ASSY | VAR.

E-H RESEARCH LABORATORIES, INC.
OAKLAND, CALIFORNIA

TITLE: MODEL 132 A POWER SUPPLY

	INITIALS	DATE	I.D. NO	DWG. NO	ISSUE
DRAWN	AAS	8/15		D-10679	A
CHK'D					
APP'D				SHEET NO. OF	SHEETS

REVISIONS						
ISSUE	REVISION	DATE	DRAWN	CHK'D	APPV'D	E. O.
A	ORIG. REL.	8/62				

PROPRIETARY INFORMATION
E-H RESEARCH LABORATORIES, INC.
NO INFORMATION GIVEN HEREIN MAY BE DISSEMINATED TO ANY PERSON OR COMPANY WITHOUT THE EXPRESS PERMISSION OF E-H RESEARCH LABORATORIES, INC.

D-10680 A

TITLE: SCHEMATIC RF DECK MODEL 132A

D-10680 A

SHEET NO. ____ OF ____

EXT. DRIVE INPUT

C1 — C6

5 .05 .005 500P

50 .5 .5KC 50KC 500KC

500Ω 50Ω 5Ω

S1

3.5MC

FREQ. RANGE

FINE

2.5K R2

10K, 1/2W EXT. R1

C7 .01

160 R10

IN746 CR1

+5.2V

+1.6 −1.8 1.9μS

GATE INPUT

TRIGGER OUTPUT

C14 .01

.04μS 0 −5.0

S2

C16 C20

.001 .01 .1 1 10 .1μs 1μs 10μs .1ms 1ms 10ms

10K R43

DELAY

FINE

1K, 1/2W R25

10K R26

560 R27

−2.4 −4.6 .72μS

S3

C29 C33

10K R44

WIDTH

FINE

1K R38

10K R39

560 R40

−5.2V

L1 L2 L3 L4 L5 L6

1.5μh L10

C8 25 C9 .01

100 R3 150 R7 220 R8

IN751A CR3

Q1 2N966 Q2 2N966

10 R4 10 R6 1K R9

180 R5

C10 25 C11 .01

C12 10P

IN34A CR4

220 R17 30K R18 75 R19

Q5 2N706B

C15 150PF

2.4K R15

C13 100PF

Q3 2N741 Q4 2N966

CR6 IN270 CR7 IN746 CR8-9 2x IN270

IN270 CR5

30K R12 300 R13 18K R14

+5.2V

IN270 CR10 IN270 CR11

180 R16

750 R20

Q6 2N966 Q7 2N966

ID6-050 CR12

330 R21 430 R22

C23 25 C24 .01

Q8 2N966

R24

180 R23

C21 25 C22 .01

75 R35

Q12 2N966

R36

160 R37

Q9 2N741

IN34A CR13 IN270 CR14

750 R34

Q10 2N966 Q11 2N966

ID6-050 CR15

2K R30 300 R31

330 R32 430 R33

C25 25 C26 .01

Vo, GND

+5.2

+5.2

NOTES:
UNLESS OTHERWISE SPECIFIED,
1. ALL RESISTANCES GIVEN IN OHMS.
2. ALL CAPACITANCES GIVEN IN MICRO-FARADS (PF = PICO FARADS).
3. WAVEFORMS OBSERVED ON "TEKTRONIX" MODEL 541A OSCILLOSCOPE (TYPE L PLUG-IN). MODEL 132A CONTROLS SET AS FOLLOWS:
(A) FREQUENCY RANGE - 50KC TO 500KC, FINE-SET TO MAX. (FULL CW)
(B) DELAY RANGE - 1.0μS TO 10μS, FINE-SET TO MIN (FULL CCW)
(C) WIDTH RANGE - 1.0μS TO 10μS, FINE-SET TO MIN (FULL CCW)

PRINTED CIRCUIT BOARD

+1.4V −0.7V 0.67μS

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

TO OUTPUT SCHEMATIC

QTY	ITEM NO.	PART NO.	DESCRIPTION	SCHEMATIC OR SPEC. REF.
-01				

MATERIAL LIST

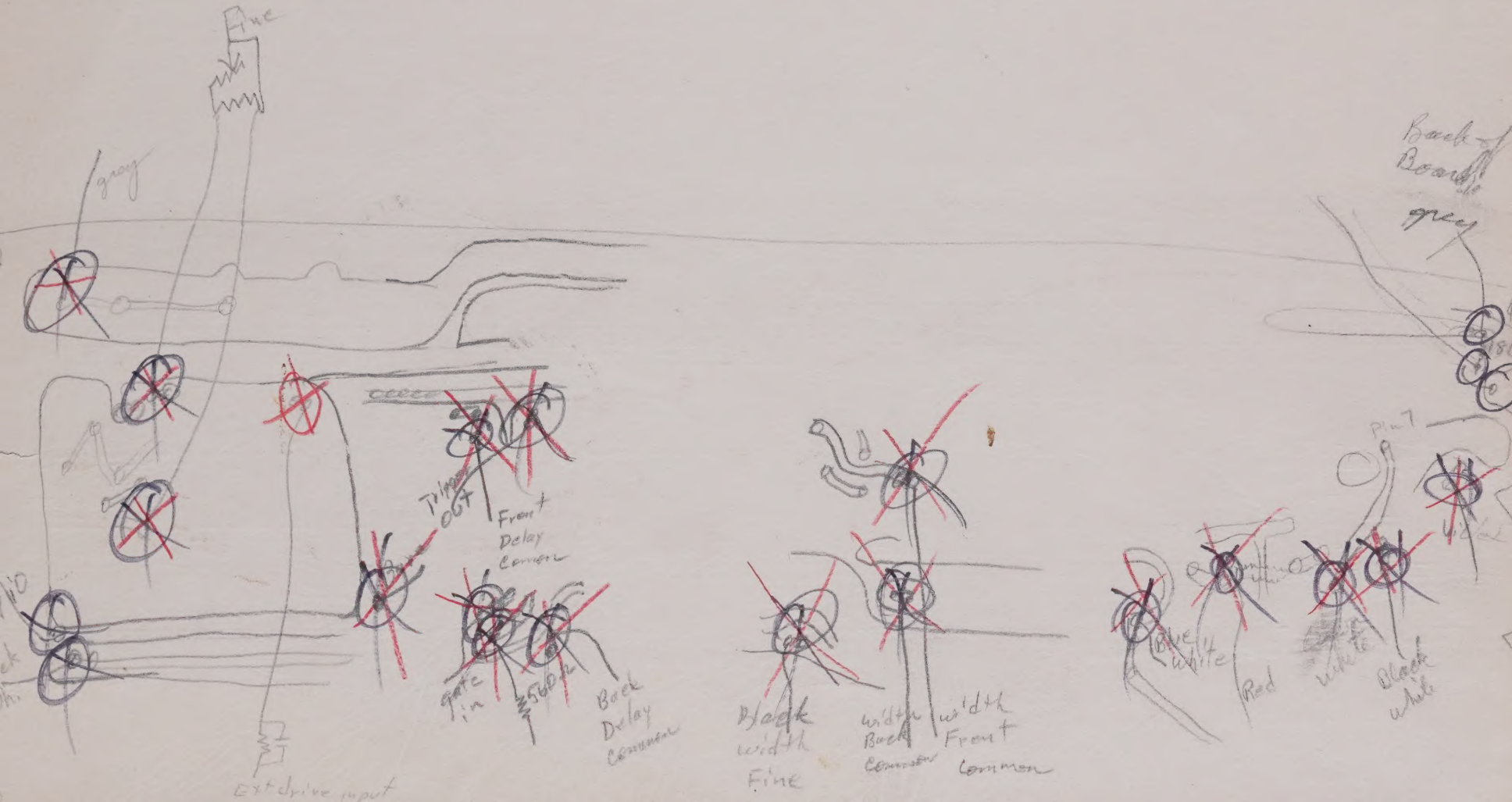
UNLESS OTHERWISE SPECIFIED
SCALE:
DIMENSIONS ARE IN INCHES
TOLERANCE FRACT.: ±
DECIMALS: ±
ANGLES: ±
HOLE DIAMETERS: ±
MACHINED SURFACES: √
BREAK & DEBURR SHARP EDGES
DO NOT SCALE DRAWING
FINISH:

E-H RESEARCH LABORATORIES, INC.
OAKLAND, CALIFORNIA

TITLE: SCHEMATIC RF DECK MODEL 132A

	INITIALS	DATE	L.D. NO.	DWG. NO.	ISSUE
DRAWN	AAS	8-2462		D-10680	A
CHK'D					
APP'D					

SHEET NO. ____ OF ____ SHEETS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Trigger OUT
Front Delay Common
gate in
Back Delay Common
Ext drive input
Black width Fine
width Back Common
width Front Common
Back Board
gray
Pin 7
Blue white
Red
Black white